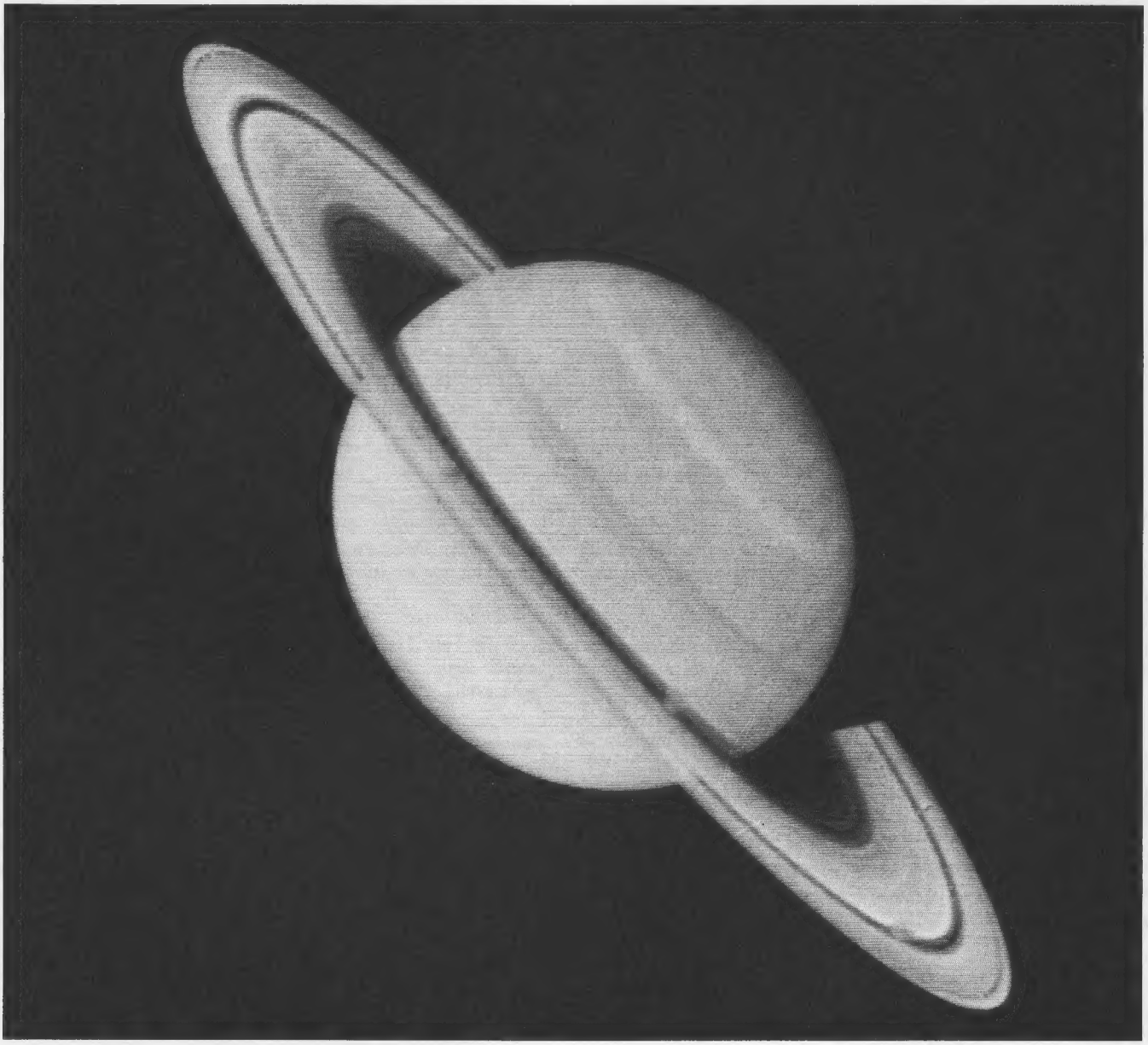
Voyager Bulletin

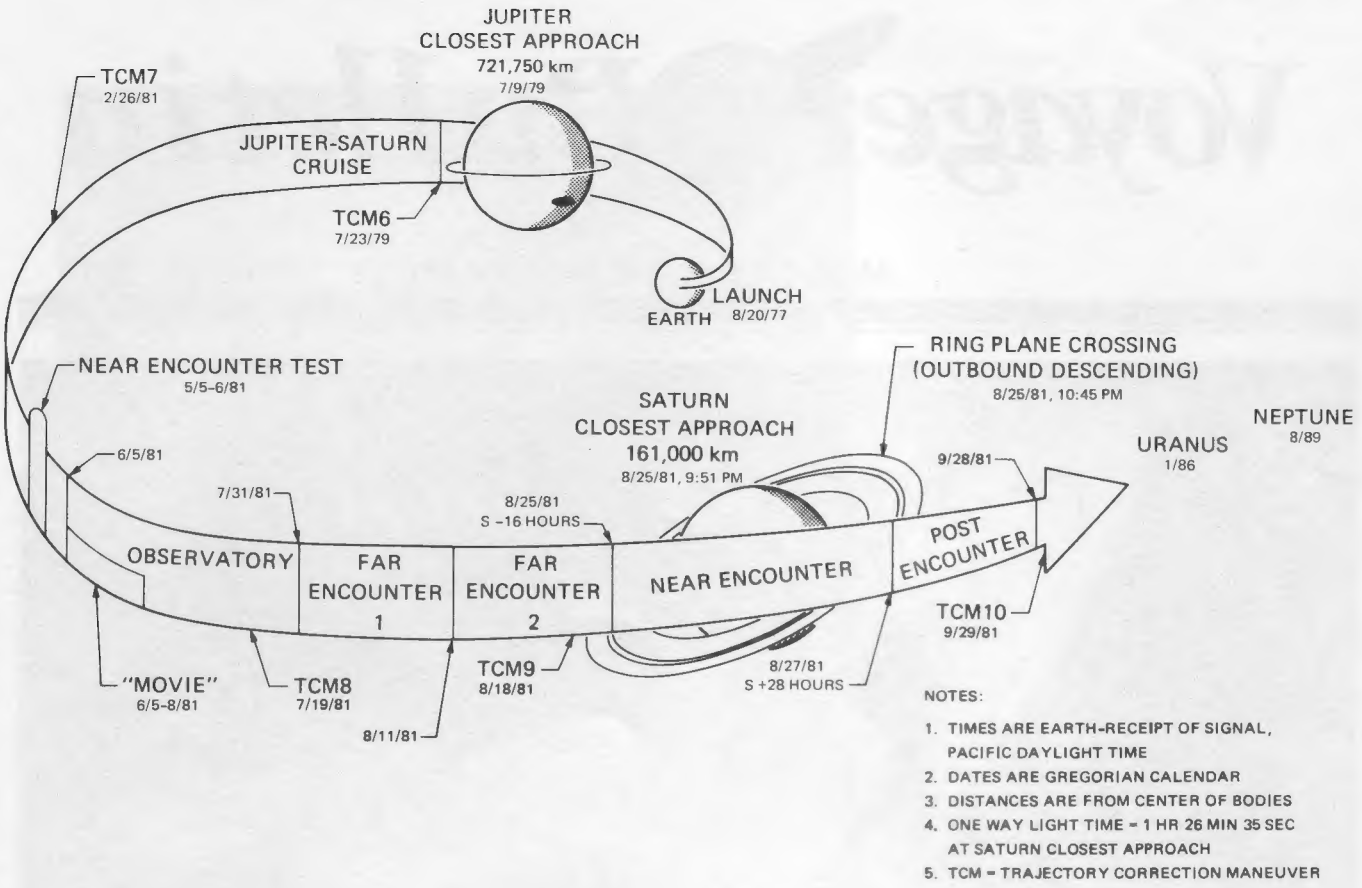
MISSION STATUS REPORT NO. 62 JUNE 26, 1981



Voyager 2 captured this image of Saturn on June 14, 1981, from a distance of 69 million kilometers (41 million miles). Banding can clearly be seen in the northern hemisphere. Starting at the ring tips, the following features can be seen: outer A-Ring; dark, narrow Encke Division; inner A-Ring; wider, dark Cassini Division; wide B-Ring; and the C-Ring. The shadow of the planet cuts off the rings' image behind the planet, while the rings' shadows fall across the equatorial zone, and blend with the C-Ring in this view.

NASA
National Aeronautics and
Space Administration
Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

Recorded Mission Status (213) 354-7237
Status Bulletin Editor (213) 354-4438
Public Information Office (213) 354-5011



Voyager 2's Saturn Observations

The Saturn encounter activities have been divided into five phases, chosen based on the field-of-view of the narrow-angle camera in relation to the distance to the planet. The five phases are Observatory, Far Encounter 1, Far Encounter 2, Near Encounter and Post Encounter.

Observatory began on June 5, about 82 days before closest approach, and will run eight weeks. During this period, a short-term history of the Saturn system will be compiled. The phase began with 43 hours of nearly-continuous photography of four Saturn rotations. The images are being assembled into a "rotation movie", to be used to study changes in the atmosphere and rings over a period of time.

Throughout this phase, the narrow-angle camera will take pictures of Saturn every 72° longitude of the planet's rotation. These pictures may be assembled into an inbound "zoom" movie. The ultraviolet spectrometer will scan across the Saturn system, out to 25 Saturn radii on either side of the planet. The instrument will map the intensity of emissions from Titan's orbit, and try to identify chemical species and densities.

Radio emissions from the planet will be sampled daily by the planetary radio astronomy experiment, while the plasma wave instrument will search for plasma variations several times during the phase. Using the spacecraft's radio, experimenters will take measurements for studies of celestial mechanics and gravitational redshift.

A trajectory correction maneuver to adjust the flight path will be performed on July 19. Numerous other calibrations will also be done during the Observatory phase.

By July 31, 26 days before closest approach, the narrow-angle camera's field-of-view will no longer reliably capture the entire planet in one frame. Two-by-two mosaics (four pictures will be needed to photograph the entire planet) will signal the start of the next phase, **Far Encounter 1**. Voyager 2 will then be 24.7 million kilometers (15.3 million miles) from Saturn. The repetitive observations of the Observatory phase will continue with modifications in pointing angles and frequency. The satellite Iapetus will be studied by both the cameras and the photopolarimeter. The ultraviolet spectrometer will scan the Saturn system vertically as well as horizontally from one side of Titan's orbit to the other.

Twelve days later, the **Far Encounter 2** phase will begin when two-by-two mosaics no longer suffice to cover the entire planet. Voyager 2 will be 14.4 million kilometers (8.9 million miles) from Saturn when Far Encounter 2 begins on August 11. A trajectory correction maneuver is scheduled for August 18. All instruments will be gathering data on the planet, most of the satellites, and the near-Saturn plasma. The narrow-angle camera will focus on the B-Ring for three rotations about 12 days before closest approach to the planet, to produce a movie of the dynamics in the B-Ring and its peculiar "spokes". Closest approaches to Iapetus, Hyperion, and Titan, as well as the magnetopause crossing, occur late in the Far Encounter 2 phase — as late as 18 hours before closest approach to Saturn.

The 43-1/2-hour **Near Encounter** phase begins on August 25, 16 hours before closest approach to the planet, and runs through August 27, 28 hours after closest approach. Closest passes to Dione, Mimas, Saturn, Enceladus, Tethys, and Rhea, as well as to eight recently discovered unnamed moonlets of Saturn, will occur in this time span. To preserve a flight path beyond Saturn to Uranus, Voyager 2 will forego a close encounter with Titan. Voyager 2 will cross the ring plane only once, dipping below it nearly an hour after closest approach to Saturn. This late ring plane crossing will afford better views of the planet's northern hemisphere than obtained by Voyager 1, which dipped below the ring plane nearly 18 hours before closest approach and then rose above again about four hours after Saturn encounter.

Twenty minutes before closest approach to the planet, Voyager 2 will be 55,200 kilometers (34,300 miles) above the edge of the A-Ring – the closest approach to the ring plane itself. Voyager 2 will pass about 161,000 kilometers (100,000 miles) from the planet's southern hemisphere at 8:25 p.m. August 25 (Pacific Dayling Time), when the countdown clocks to Saturn encounter will all turn to 00:00:00. Signals from the spacecraft will travel 1 hour 26 minutes 35 seconds to reach earth.

Voyager 2's Saturn observations will continue in the **Post Encounter** phase from August 27 through September 28.

As the spacecraft leaves Saturn behind, it will fire its gas thrusters on September 29 to adjust its course for the next planet in its path, ringed Uranus. Voyager 2 will cruise for about 4-1/2 years, taking measurements in interplanetary space before becoming the first spacecraft from earth to explore Uranus, its rings, and its moons Ariel, Miranda, Oberon, Titania, and Umbriel.

Changes in Science Emphasis

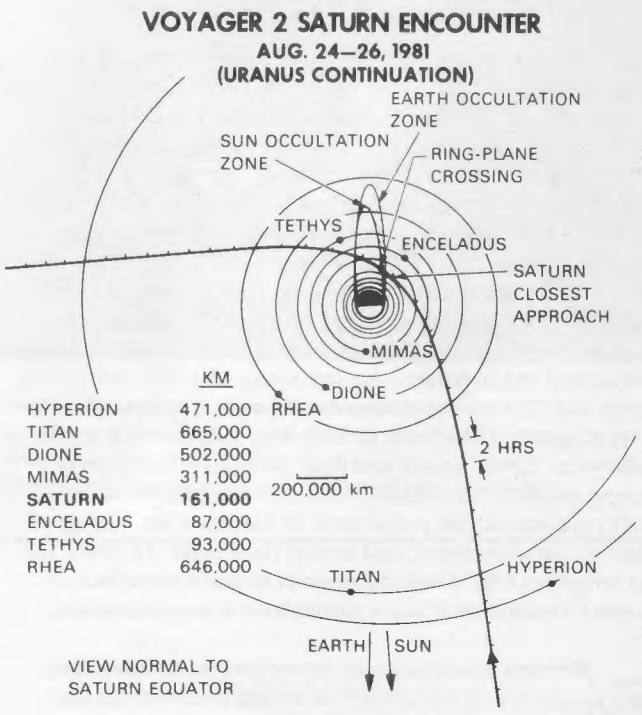
As a result of Voyager 1's spectacular findings last fall, mission planners have made many changes to the original tasks to be performed by Voyager 2. Because of Voyager 1's amazing findings last fall, Voyager 2's emphasis will be on the rings. The F-ring will be studied in detail to learn more about its structure, which appeared to be three interwoven elements in Voyager 1's photos. F-ring dynamics will also be studied closely. The non-circular, or eccentric, rings will also be scrutinized as scientists try to learn the causes of these peculiarities. The eccentricities may be related to gravitational resonances from the satellite Mimas, at some distance from the rings. Voyager 1 recorded 10 Megawatt electrical discharges in the rings, so Voyager 2's planetary radio astronomy receivers will be searching for additional evidence of these discharges, which are similar to lightning discharges here on earth. The photopolarimeter will track a star, Delta Scorpii, through the ring material. The varying brightness of the star will give an indication of ring density at various points.

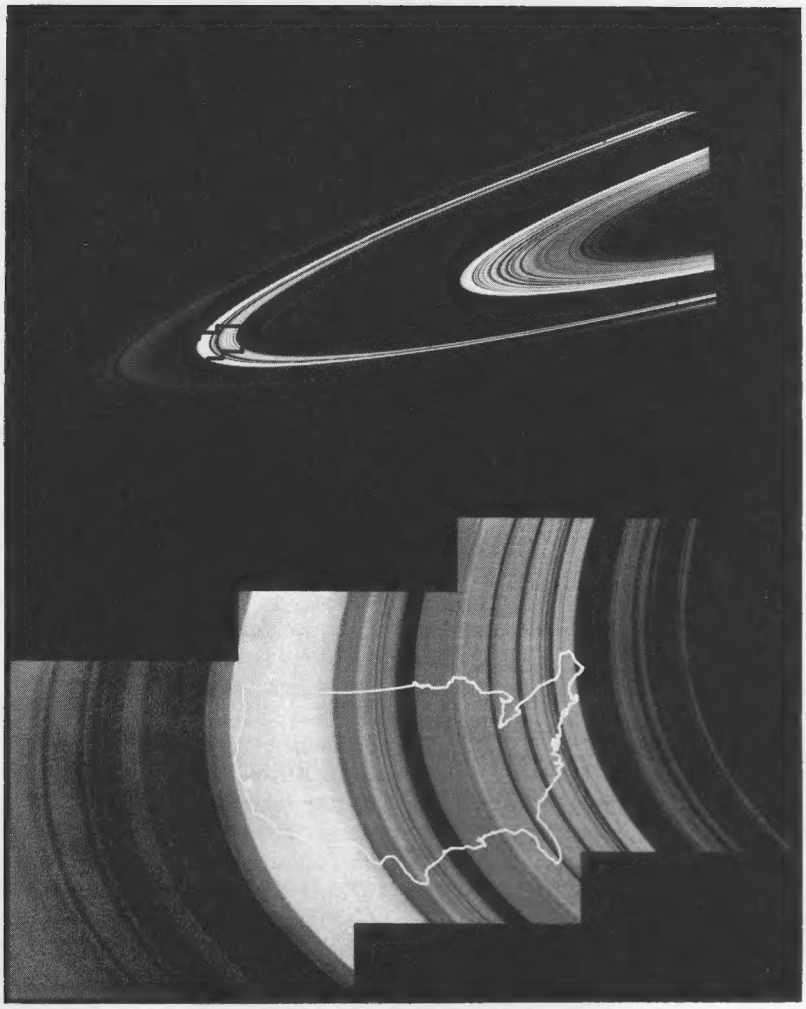
At the planet, Voyager 2 is expected to obtain better temperature measurements at various latitudes; better measurements of the rings, atmosphere and ionosphere using the radio; and better characterization of the auroras, which are seen in the ultraviolet.

Voyager 2 will obtain closer flybys of Iapetus, Hyperion, Enceladus, Tethys, and Phoebe. Enceladus is especially interesting since Voyager 1 photos showed little evidence of surface features, indicating there may be dynamic geological processes occurring. Voyager 2 will photograph Enceladus and Tethys with high resolution and also take measurements as these satellites eclipse the sun. Voyager 2's photopolarimeter is in good working order, so it will be able to look for aerosols on Titan, something Voyager 1 was unable to do. The "rocks", the tiny satellites near the planet, will also be studied in greater detail.

The "Rocks"

With the earth-based discoveries earlier this year of two more small moons of Saturn, the number of Saturnian moons has risen to 17. Satellites 10 through 17 are collectively (and affectionately) called "the rocks" because of their small sizes. (The nomenclature Satellite 10, etc., is used by the Voyager Project pending official confirmation and christening by the International Astronomical Union.) The satellites currently referred to as 10 and 11 share an orbit about 14,400 kilometers (8,900 miles) outside the outer edge of the A-Ring. Satellite 12 shares an orbit with the larger satellite Dione about 242,000 kilometers (151,100 miles) outside the A-Ring. Satellites 13 and 14 shepherd the F-Ring between them, while Satellite 15 orbits near the edge of the A-Ring. The two new rocks, Satellites 16 and 17, appear to share an orbit with Tethys, about 164,400 kilometers (102,000 miles) outside the A-Ring. One appears to "lead" Tethys in its orbit, and is about 10 to 20 miles in diameter, while the other satellite is smaller and trails Tethys. Tethys is the only satellite known that apparently has both leading and trailing satellites. Voyager 2's cameras will be targetted to each of these satellites, hoping to learn more about what they are made of, how they were made, and how they got where they are.





Voyager 1 took these photos of Saturn's rings and the Cassini Division last fall. A portion of the upper photo, indicated by the outline, is seen at a closer distance below. The outline of the United States gives an indication of the distances involved. In Earth-based pictures, the Cassini Divison, a 3500-kilometer region between the classical A- and B-Rings, appears empty. Voyager 1 found it to be full of individual ringlets, as seen here. Some of these ringlets are as wide as 800 kilometers. In this picture, the Cassini Division is the region from the dark area at about the Mississippi River on the overlaid map to the eastern tip of Maine. The wide bright ring overlaid by the Western states is the inner edge of the A-Ring.

Update

Voyager 2 is 61 days from its closest approach to Saturn on August 25. Travelling with a velocity of 56,310 kilometers (34,990 miles) per hour relative to the sun, it is 57.3 million kilometers (35.6 million miles) from the ringed planet. Saturn observations officially began on June 5, and will continue through September 28. With the exception of its failed main radio receiver, the failed capacitor in the backup radio receiver (both failures occurred in April 1978), and several smaller problems that are being studied, the spacecraft is in good health, with all science instruments operating. The plasma wave investigators report that Voyager 2 has re-entered Jupiter's magnetic tail, nearly two years and 300 million miles after it passed Jupiter. Planets with magnetic fields tend to have long magnetotails as the solar wind flows around and past the planet, but Jupiter's magnetosphere is especially large. The alignment of Jupiter's magnetotail did not extend to Saturn when Voyager 1 flew by last November, and occurs once every 13 years, the investigators say. They are anxious to learn the effect of Jupiter's magnetotail upon Saturn's own magnetosphere.

Voyager 1 continues its investigations of interplanetary space, having completed its Saturn observations last December.

Voyager Team Garners Awards

The Voyager Team has received the National Aeronautic Association's prized Collier Trophy for 1980. The team has also won the Goddard Memorial Trophy of the National Space Club for the second year in a row. In a congratulatory letter on the occasion of the Collier Trophy, President Ronald Reagan remarked, "I welcome this opportunity to salute the remarkable accomplishments of the Voyager Mission Team . . . They have penetrated age-old mysteries and given us new knowledge of ancient worlds that can only challenge us to know more. No part of our government's programs electrifies the nation's spirit more than the space effort."

At a Voyager Awards Ceremony June 2, Dr. Hans Mark, nominee for the post of NASA Deputy Administrator, expressed the hope that "some centuries from now, when people look back at the year 1980 . . . they will remember the remarkable pictures of the different worlds first visited by the Voyagers . . ." and extended "hearty congratulations" on the achievements of the Voyager Team.